

## PATENT ABSTRACTS OF JAPAN

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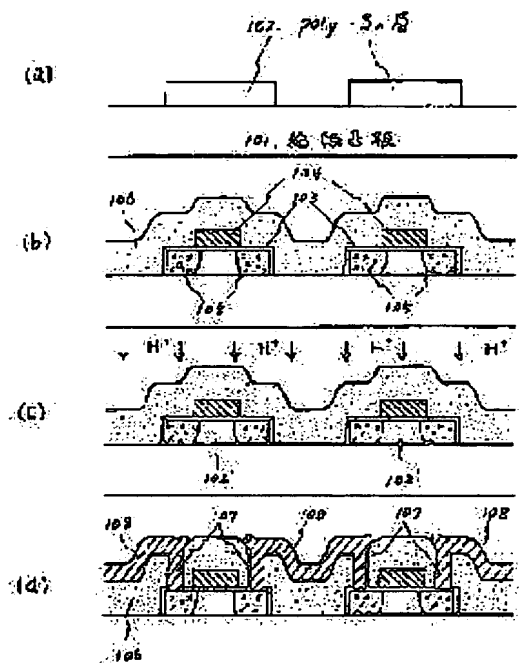
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## (54) THIN FILM TRANSISTOR DEVICE

(57)Abstract:

**PROBLEM TO BE SOLVED:** To reduce damage to a TFT in a hydrogenation process, by forming a plurality of thin film transistors of the same conductivity type composed of a hydrogenated polycrystalline Si layer on a peripheral area of a substrate, separated like islands each composed of several transistors.

**SOLUTION:** On an insulation substrate 101, a poly-Si layer 102 is formed and patterned such that TFTs are separated like islands, a gate insulation film 103, gate electrodes 104, source-drain regions 105 and layer insulation film 106 are formed, the poly-Si layer 102 is hydrogenated by the method of H plasma treatment, etc., and contact holes 107 are bored through the layer insulation film 106 to form a wiring pattern 108. By separating the Si layer for every TFT, the damage in the hydrogenation process of H plasma treatment, H ion implantation, etc., is eliminated, and hence the damage to TFTs in the hydrogenation process can be reduced.



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**CLAIMS**

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[Claim(s)]

[Claim 1] In the thin film transistor equipment which the thin film transistor of two or more same conductivity types is formed on a substrate, and comes to connect either the source of the thin film transistor of said same conductivity type, or a drain field with power-source Rhine The thin film transistor of two or more of said same conductivity types consists of a polycrystalline silicon layer by which the hydrogen treating was carried out. It comes to carry out separation formation of the thin film transistor arranged around said substrate at the shape of an island for every some. Thin film transistor equipment with which connection wiring for connecting one side or another side of the source of the thin film transistor of said same conductivity type or a drain field is characterized by another member coming to be formed with said polycrystalline silicon layer.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to thin film transistor (TFT) equipment.

[0002]

[Description of the Prior Art] Compared with TFT to which TFT which made polycrystalline silicon (Poly-Si) component material made amorphous silicon (a-Si) component material, mobility is high about 1-2 figures, and since ON current can take highly, the application as scanning circuits (shift register), such as a liquid crystal display and individual image pick-up equipment, is progressing. (IEEE Trans Electron Devices, ED-32, No.8, P.1546 (1985)) The requests of enlargement and degree[ of high solution ]-izing will mount, and the liquid crystal display and the solid state camera (for example, contact type image sensor of a single dimension) need to time improvement in the speed of a scanning circuit in recent years. Then, the attempt which raises mobility has accomplished by hydrogenating the defect which exists in the grain boundary (grain boundary) of the Poly-Si film by the approach of hydrogen plasma treatment and hydrogen ion in plastic \*\*.

[0003]

[Problem(s) to be Solved by the Invention] However, Poly-Si When TFT is hydrogenated by the hydrogen plasma and hydrogen ion in plastic \*\*, moreover, it is Poly-Si near the woofer edge with which the pattern of the Poly-Si layer 102 was connected continuously. The phenomenon in which the property of TFT became unusual became clear.

[0004]

[Means for Solving the Problem] In the thin film transistor equipment to which the thin film transistor of the same conductivity type of plurality [ this invention / top / substrate ] is formed in, and it comes to connect either the source of the thin film transistor of said same conductivity type, or a drain field at power-source Rhine The thin film transistor of two or more of said same conductivity types consists of a polycrystalline silicon layer by which the hydrogen treating was carried out. It comes to carry out separation formation of the thin film transistor arranged around said substrate at the shape of an island for every some. Connection wiring for connecting one side or another side of the source of the thin film transistor of said same conductivity type or a drain field is characterized by another member coming to be formed with said polycrystalline silicon layer.

[0005]

[Embodiment of the Invention] An example of the production process Fig. of the thin film transistor in the example of this invention is shown in drawing 1 .

[0006] In drawing 1 , (a) forms the Poly-Si layer 102 on 101 insulation machine night. Each process which carries out pattern formation so that TFT may be separated in the shape of an island, the process in which (b) forms gate dielectric film 103, the gate electrode 104, the source drain field 105, and an interlayer insulation film 106, (c) is the approach of hydrogen plasma treatment and hydrogen ion in plastic \*\*, and the process which hydrogenates Poly-Si layer 102', and (d) are processes which make the contact hole 107 in this interlayer insulation film 106, and form a circuit pattern 108.

[0007] Drawing 2 shows some top views of the thin film transistor scanning circuit of this invention. A scanning circuit is the shift register of CMOS structure, and consists of an inverter, a clocked inverter, etc. Drawing 2 has shown an example of some top views of the clocked inverter section.

[0008] drawing 2 -- setting -- 201 -- VDD Rhine and 202 -- VSS Rhine and 203 -- P channel TFT and 204 -- the N channel TFT and 205 -- a gate electrode and 206 -- a contact hole and 207 (slash section of drawing) -- every

-- 208 shows a circuit pattern (the same ingredient as VDD and VSS) for the pattern of a separation \*\*\*\*\* Poly-Si layer for every TFT.

[0009] a thin film transistor circuit is constituted in drawing 3 -- it comes out and the property Fig. of TFT is shown.

[0010] In drawing 3, 301 shows the property of TFT inside the shift register which consists of TFT which separated the Poly-Si layer in the shape of an island based on this invention. Moreover, 302 shows the property of TFT inside a shift register in case the Poly-Si layer is connected with band-like, as shown in drawing 4. In addition, drawing 3 has shown the property of TFT by N channel, and an axis of ordinate shows the electrical potential difference VGS to which an axis of abscissa impresses the current IDS between (Source S)-drains (D) between the (Source S)-gates (G). Measurement was performed by electrical-potential-difference VDS=5V between (Source S)-drains. Moreover, measured TFT measured TFT of the location (very end) whose distance from a substrate (wafer) edge is 9mm for 301,302.

[0011] Drawing 4 is drawing 3. Some top views of the thin film transistor scanning circuit of the conventional type which showed the property to 302 are shown. VDD Rhine and 402 show VSS Rhine and the Poly-Si layer to which a gate electrode and 406 were connected with the contact hole, and P 407 (slash section of drawing) was connected [ 403 / TFT and 404 ] with band-like by the N channel TFT and 405, and, as for 408, 401 shows a circuit pattern (the same ingredient as VSS and VSS Rhine).

[0012] From drawing 3, by separating a silicon layer for every TFT, the damages (shift of Vth (SURESSHORUDO electrical potential difference) of TFT etc.) in the process which performs hydrogenation of hydrogen plasma treatment and hydrogen ion in plastic \*\* are lost, and a highly efficient TFT scanning circuit can be produced now with sufficient repeatability.

[0013] the property Fig. of TFT which constitutes the thin film transistor scanning circuit where the Poly-Si layer which showed drawing 5 to drawing 4 was connected with band-like -- it is -- the distance from a substrate (wafer) edge -- \*\* -- it investigates about TFT. In drawing 5, 502 shows 14mm TFT from a substrate edge, and 503 shows the property of 200mm TFT for the property of TFT which 501 has in a 9mm location from a substrate edge from a substrate edge again. In TFT by which Poly-Si was connected with band-like, drawing 5 shows hardly receiving a damage, when there is an inclination for a damage to become large and it separates from a substrate edge to some extent so that a substrate edge is approached. On the other hand, like, when [ which was shown in drawing 3 ] a Poly-Si layer is separated, since a damage is not received near the substrate edge, it turns out that especially the thing separated as TFT of the part near a wafer edge is shown in drawing 2 is effective.

[0014] moreover -- said example -- every -- although the example which separates TFT, respectively was shown -- in addition, some TFT(s) -- Shimagami of one Poly-Si -- forming -- some -- \*\* -- reduction of the damage in which TFT also receives the approach of it being alike, and separating and forming TFT -- effectiveness -- it is - - every -- compared with the case where TFT is separated, respectively, there is a merit which can make the pattern dimension of TFT small. Furthermore, the approach of separating and forming TFT is effective in the reduction also damages, such as dry etching, or besides the damage of the hydrogen plasma and hydrogen ion in plastic \*\*.

[0015]

[Effect of the Invention] Like, according to this invention, the damage which TFT receives at the process which was described above, and which hydrogenates can be reduced sharply, and a highly efficient scanning circuit can be produced now with sufficient repeatability. This is large-sized and serves as a very effective means for implementation of the solid state camera of high resolution, a liquid crystal display, etc. in addition, this invention -- not only a scanning circuit but Poly-Si width, such as the circuit constituted by TFT, for example, a logical circuit, a widening circuit, and a memory circuit, -- it is widely applicable.

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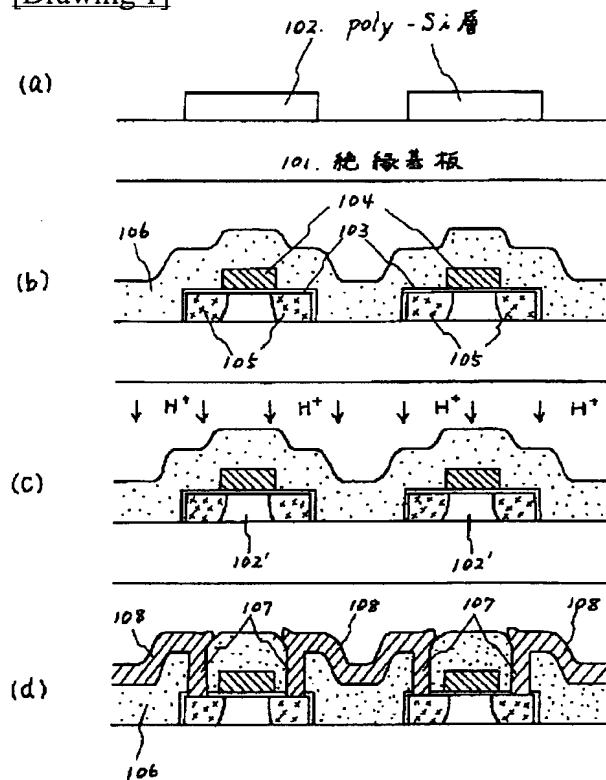
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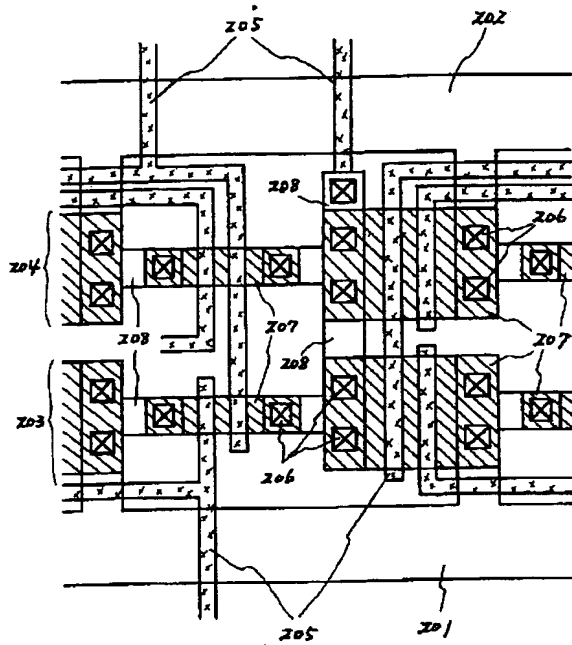
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## DRAWINGS

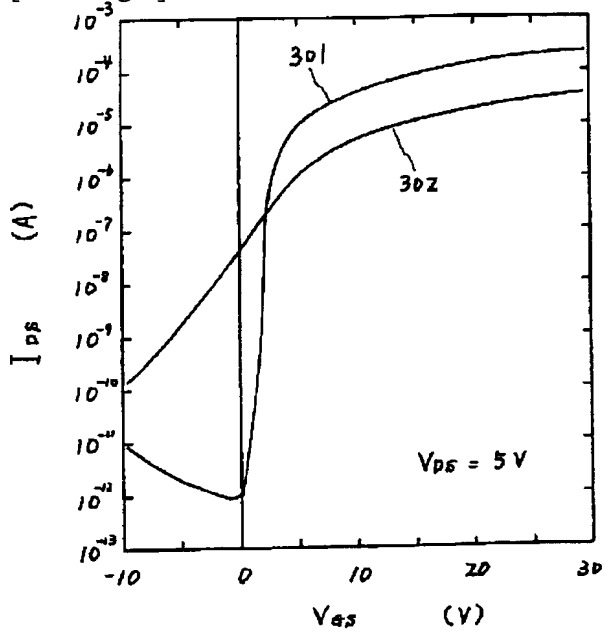
[Drawing 1]



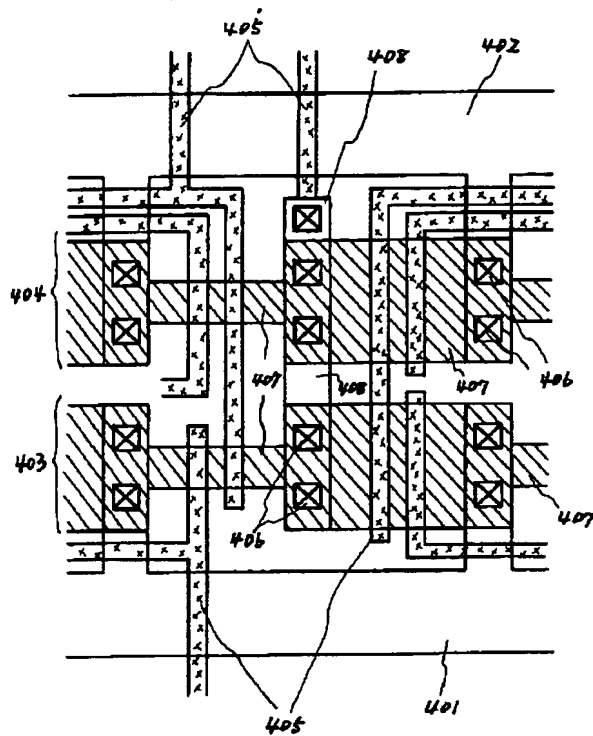
[Drawing 2]



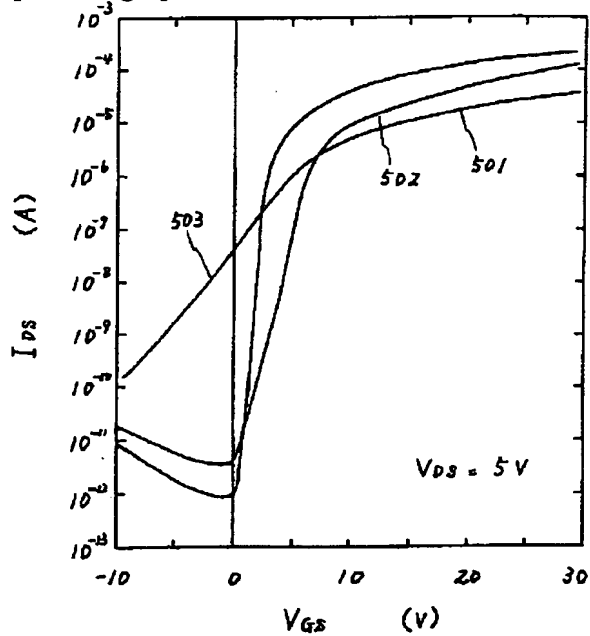
[Drawing 3]



[Drawing 4]



[Drawing 5]



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